

CLAIMS

1.- A polymer composition with elastomeric properties at wide temperature ranges of a type comprising polymers and/or copolymers resulting from substituted or unsubstituted vinyl aromatic monomers and from dienic monomers, which comprises from 15 to 85% by weight of a copolymer containing at least one block from 10 to 5000 mainly syndiotactic structural sequences of monomer units resulting from at least one substituted or unsubstituted vinyl aromatic monomer, and at least one block formed by 10 to 4000 monomer units resulting from at least one dienic monomer having mainly a 1,4-cis structure; from 15 to 85% by weight of a polymer resulting from dienic monomers having a molecular weight between 6000 and 600000, wherein the contents of 1,4-cis monomer units is of at least 90%; and up to 70% of a polymer resulting from substituted or unsubstituted vinyl aromatic monomers having a molecular weight between 10000 and 500000 and a degree of syndiotacticity in terms of syndiotactic pentads of at least 95%.

2.- The polymer composition with elastomeric properties at wide temperature ranges according to claim 1, wherein vinyl aromatic monomers are selected from styrene and substituted styrene.

3.- The polymer composition with elastomeric properties at wide temperature ranges according to claim 2, wherein the vinyl aromatic monomer is substituted styrene whose substituents are selected from alkyl, halide, alkoxy, and amine groups.

4.- The polymer composition with elastomeric properties at wide temperature ranges according to claim 2, wherein the vinyl aromatic monomers are selected from styrene, 4-methyl styrene, 4-ter-butyl styrene, 4-methoxy styrene, 4-trimethylsiloxy styrene, 4-bromo styrene, and 4-(N-N'-dimethyl amine)styrene.

5.- The polymer composition with elastomeric properties at wide temperature ranges according to claim 1, wherein the dienic monomer is selected from buta-1,3-diene and 2-methyl buta-1,3-diene.

6.- The polymer composition with elastomeric properties at wide temperature ranges according to claim 1, wherein the fraction formed by the monomer units resulting from the dienic monomer is partially or fully hydrogenated.

7.- The polymer composition with elastomeric properties at wide temperature ranges according to claim 6, wherein the fraction formed by the monomer units resulting from the dienic monomer is hydrogenated by 95%.

5 8.- The polymer composition with elastomeric properties at wide temperature ranges according to claim 1 further containing from 0.01 to 4% by weight of at least one organic or inorganic additive.

9.- The polymer composition with elastomeric properties at wide temperature ranges according to claim 8, wherein the inorganic additive is selected from compounds containing aluminum.

10 10.- The polymer composition with elastomeric properties at wide temperature ranges according to claim 9, wherein the compounds containing aluminum are selected from aluminum oxide or compounds with the general formula $(-Al(X)O-n)$, wherein X is selected from the hydroxyl, alkoxyde, or alkyl groups and n is a natural number.

15 11.- The polymer composition with elastomeric properties at wide temperature ranges according to claim 10, wherein $(-Al(X)O-n)$ results from making react the compounds with the general formula $(-Al(R)O-m)$ with water or alcohols, wherein R is an alkyl group and m is a natural number.

20 12.- The polymer composition with elastomeric properties at wide temperature ranges according to claim 8, wherein the organic additive is at least an antioxidant agent.

13.- The polymer composition with elastomeric properties at wide temperature ranges according to claim 12, wherein the antioxidant agent is selected from those containing phenols, phosphates, and amines.

25 14.- The polymer composition with elastomeric properties at wide temperature ranges according to claim 1 further exhibiting a first glass transition temperature (T_g 1) within the temperature range from $-148^{\circ}F$ and $-130^{\circ}F$.

30 15.- The polymer composition with elastomeric properties at wide temperature ranges according to claim 1 further exhibiting a second glass transition temperature (T_g 2) within the temperature range from $203^{\circ}F$ to $248^{\circ}F$.

16.- The polymer composition with elastomeric properties at wide temperature ranges according to claim 1 further exhibiting a melting temperature T_m within the temperature range from $428^{\circ}F$ to $572^{\circ}F$.

35 17.- The polymer composition with elastomeric properties at wide temperature ranges according to claim 1, wherein the elastomeric behavior of

such a polymer composition extends from -121 °F to the degradation temperature of the monomer units resulting from the dienic monomer.

18.- The polymer composition with elastomeric properties at wide temperature ranges according to claim 1, wherein the modulus of elasticity of such 5 a polymer composition ranges between 10 y 1000 Mpa within the temperature range from -121 °F to 194 °F.

19.- The polymer composition with elastomeric properties at wide temperature ranges according to claim 1, wherein the modulus of elasticity of such 10 a polymer composition ranges between 3 and 100 Mpa within the temperature range from 248 °F and the dienic polymer degradation temperature.

20.- A process to prepare a polymer composition with elastomeric properties at wide temperature ranges of the type comprising a first contact polymerization stage of at least one vinyl aromatic monomer which is polymerizable by a catalytic system as that comprising a pre-catalyzer consisting 15 of one or more compounds pertaining to the class of compounds such as titanium fluorenyl trialkoxyde, and an activating compound selected from aluminum compounds obtained by trialkylaluminum hydrolysis, followed by a second polymerization stage through subsequent addition of a dienic monomer and, finally, a third stage that includes mixing a reactive mixture with an alcohol in order 20 to form a non-hydrogenated polymer composition, wherein a catalytic residue removal stage is then performed by using a mixture of an aliphatic alcohol with a dissolvent having at least one substituted or unsubstituted aromatic ring.

21.- The process to prepare a polymer composition according to claim 20, wherein the aliphatic alcohol : aromatic solvent ratio ranges between 25 0.5:1 and 5:1.

22.- The process to prepare a polymer composition according to claim 21, wherein the aliphatic alcohol: aromatic solvent ratio is of 1.1.

23.- The process to prepare a polymer composition according to claim 20, wherein the aliphatic alcohol from the catalytic residue removal stage is 30 selected from alcohols having from 1 to 4 carbon atoms.

24.- The process to prepare a polymer composition according to claim 23, wherein the aliphatic alcohol from the catalytic residue removal stage is iso-propanol, whereas the aromatic solvent is toluene.

25.- The process to prepare a polymer composition according to claim 20, wherein the pre-catalyzer component is titanium fluorenyl triisopropoxide.

26.- The process to prepare a polymer composition according to 5 claim 20, wherein the activating component is a methylaluminoxane.

27.- The process to prepare a polymer composition according to claim 20, wherein the vinyl aromatic monomer is polymerized in mass or with the presence of a dissolvent.

28.- The process to prepare a polymer composition according to 10 claim 27, wherein the dissolvent is selected from aromatic dissolvents, aliphatic dissolvents, or a mixture thereof.

29.- The process to prepare a polymer composition according to claim 28, wherein the aromatic dissolvent is toluene.

30.- The process to prepare a polymer composition according to 15 claim 28, wherein the aliphatic dissolvent is 2,2,4-trimethyl pentane.

31.- The process to prepare a polymer composition according to claim 20, wherein the contact of the polymerizable vinyl aromatic monomer with the catalytic system is performed at a temperature from 32 °F to 194 °F and for a period of time from 1 to 30 minutes.

20 32.- The process to prepare a polymer composition according to claim 20, wherein the contact of the polymerizable vinyl aromatic monomer with the catalytic system is performed at a temperature from 68 °F to 122 °F and for a period of time from 1 to 30 minutes.

25 33.- The process to prepare a polymer composition according to claim 20, wherein the polymerization stage of the dienic monomer is performed at a temperature from 32 °F to 158 °F.

34.- The process to prepare a polymer composition according to claim 20, wherein the first and second polymerization stages are performed in a period of time from 10 minutes to 6 hours.

30 35.- The process to prepare a polymer composition according to claim 20, wherein the alcohol is an aliphatic alcohol.

36.- The process to prepare a polymer composition according to claim 35, wherein the alcohol is iso-propanol.

35 37.- The process to prepare a polymer composition according to claim 20, wherein the dienic monomer polymerization stage is followed by a

hydrogenation stage through direct contact with hydrogen without the need of using additional hydrogenation catalysts and, finally, by a stage that includes mixing the reactive mixture with an alcohol in order to form a hydrogenated polymer composition.

5 38.- The process to prepare a polymer composition according to claim 37, wherein the hydrogenation stage is performed at a partial hydrogen pressure from 10 to 150 psig.

 39.- The process to prepare a polymer composition according to claim 38, wherein the partial hydrogen pressure is from 20 to 100 psig.

10 40.- The process to prepare a polymer composition according to claim 37, wherein the hydrogenation stage begins once the dienic monomer has been converted by at least 50% in the second polymerization stage.

 41.- The process to prepare a polymer composition according to claim 37, wherein the hydrogenation stage is performed at a temperature from 32
15 °F to 194 °F.

 42.- The process to prepare a polymer composition according to claim 41, wherein temperature ranges between 68 °F and 158 °F.

 43.- The process to prepare a polymer composition according to claim 37, wherein the dienic monomer is converted by at least 95%.

20 44.- The process to prepare a polymer composition according to claim 37, wherein the resulting materials have at least 95% of hydrogenated polybutadiene.

SUMMARY OF THE INVENTION

It is depicted a polymer composition with elastomeric properties at wide temperature ranges of the type comprising polymers and/copolymers 5 resulting from substituted or unsubstituted vinyl aromatic monomers and from dienic monomers, which is homogeneous and compatible in nature, with such composition being based on stereoregular polymers and without requiring the additional use of compatibilizing agents. Likewise, it is depicted the process to obtain the same, as well as to hydrogenise them, without requiring the use of 10 additional catalysts or processes.

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